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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,033	03/31/2004	Christophe J. Dorrer	9-10-7-9	7803
46363 7590 07/09/2008 PATTERSON & SHERIDAN, LLP/ LUCENT TECHNOLOGIES, INC 595 SHREWSBURY AVENUE SHREWSBURY, NJ 07702			EXAMINER LE, THI Q	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/815,033

Applicant(s)

DORRER ET AL.

Examiner

THI Q. LE

Art Unit

2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 May 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-10, 12-14, 19-23, 25, 26, 28 and 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-10, 12-14, 19-23, 25-26, 28-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsman's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Priority

1. Applicant's claim for domestic priority under 35 U.S.C. 119(e) is acknowledged.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 31-32 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Newly amendment limitations in claims 31-32 have insufficient support in the disclosure; i.e. "non-adjacent bits" lacks detail description within the disclosure.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2613

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35

U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. **Claims 10, 2-3, 29** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ito (US Patent # 6,650,846)** in view of **Miyamoto et al. (US Patent # 7,116,917)**.

Consider **claim 10**, Ito clearly shows and discloses, a method comprising: precoding an electronic data signal (an intensity modulator 2, modulating optical signal with NZR data; figure 13); modulating the output of an optical source using the precoded electronic data signal and differential phase shift keying to generate an encoded optical signal (phase modulator 3, modulating the optical signal using phase modulation scheme; figure 13); and alternating the polarization of the encoded optical signal using a modulator such that successive optical bits have substantially orthogonal polarizations to generate an APol-DPSK signal (the polarization

modulator 4, modulates the output from unit 3; such that, adjacent bits are mutually orthogonal in term of polarization; figure 13) (figure 13; column 10 lines 19-35). The Examiner takes Official Notice that it is well known in the art to use phase shift keying and differential phase shifting keying as modulation scheme for long distance transmission, since they offer efficient bandwidth usage; thus allowing more data to be transmitted. It would have been obvious for a person of ordinary skill in the art to understand that the phase modulator 3, figure 13, disclosed in Ito can be arranged to perform PSK or DPSK modulation.

Ito fails to disclose, differential phase shift keying between two optical bits separated by an even number of bit periods; and demodulating the APol-DPSK signal using an even bit delay line interferometer.

In related art, Miyamoto discloses, an optical transmitting system. The system is configured to perform, differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal (figure 17 shows phase modulator 3 generating DPSK optical signal using the encoded signal, from precoding unit 2, with 2 bit separation; column 11 lines 16-18, column 16 lines 39-50); and demodulating the APol-DPSK signal using an even bit delay line interferometer (Figure 17 shows a 2 bit delay optical filter 5 is placed at the transmitter end, while Figure 21 shows placing an optical filter 60 at the receiver end; thus it would have been obvious that the 2 bit delay optical filter 5 shown in figure 17 can also be placed at the receiver end; column 16 lines 40-50, column 17 lines 40-55).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of

Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

Consider **claims 2 and 3, and as applied to claim 10 above**, Ito modified Miyamoto disclosed a phase modulator, but fails to disclose a phase modulator is driven by a sinusoidal RF voltage or square pulses.

The examiner take official notice that it is well known in the art at the time of the invention that either sinusoidal RF voltage or square pulse can be use to drive a typical phase modulator. Since, different applications have different requirements, thus, using sinusoidal RF voltage or square pulses to drive a phase modulator provides different fills the different requirements of a particular application.

Consider **claim 29**, Ito discloses, an optical transmission system for APol-DPSK transmission comprising: an optical source (light source 1; figure 13); a precoder device for precoding an electronic data signal (intensity modulator 2 and phase modulator 3; figure 13); an optical phase-shift-keying data modulator optically coupled to the laser source and driven by a precoded electronic data signal from the precoder device to produce an optical DPSK signal wherein electronic data to be transmitted is optically encoded by the data modulator (figure 13 shows, intensity modulator 2 and phase modulator 3, for modulating the optical signal using phase modulation scheme; figure 13); and a polarization alternator (polarization modulator 4; figure 13) optically coupled to the data modulator to provide polarization alternation of the output of the data modulator (figure 13; column 10 lines 19-35). The Examiner takes Official Notice that it is well known in the art, for a phase modulator to be arranged to perform phase shift keying or differential phase shifting keying, for the same reason as indicated in claim 10.

Ito fails to disclose, differential phase shift keying between two optical bits separated by an even number of bit periods; and demodulating the APol-DPSK signal using an even bit delay line interferometer.

In related art, Miyamoto discloses, an optical transmitting system. The system is configured to perform, differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal (figure 17 shows phase modulator 3 generating DPSK optical signal using the encoded signal, from precoding unit 2, with 2 bit separation; column 11 lines 16-18, column 16 lines 39-50); and demodulating the APol-DPSK signal using an even bit delay line interferometer (Figure 17 shows a 2 bit delay optical filter 5 is placed at the transmitter end, while Figure 21 shows placing an optical filter 60 at the receiver end; thus it would have been obvious that the 2 bit delay optical filter 5 shown in figure 17 can also be placed at the receiver end; column 16 lines 40-50, column 17 lines 40-55).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

8. **Claims 9, 5-8, 12-14, 25, 19-20, 26, 28** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ito (US Patent # 6,650,846)** in view of **Miyamoto et al. (US Patent # 7,116,917)** and further in view of **Van Der Tol (US Patent # 5,708,734)**.

Consider **claim 9**, Ito discloses, a method of APol-PSK transmission comprising: using an electronic data signal to drive a modulator to provide simultaneous polarization alternation and optical data encoding by phase shift keying to generate an APol-PSK signal (figure 13

shows, combination intensity modulator 2, phase modulator 3 and polarization modulator 4, modulate the optical signal; such that, adjacent bits are mutually orthogonal in term of polarization; column 10 lines 10-45). The Examiner takes Official Notice that it is well known in the art to use phase shift keying and differential phase shifting keying as modulation scheme for long distance transmission, since they offer efficient bandwidth usage; thus allowing more data to be transmitted. It would have been obvious for a person of ordinary skill in the art to understand that the phase modulator 3, figure 13, disclosed in Ito can be arranged to perform PSK or DPSK modulation.

Ito fails to disclose, differential phase shift keying between two optical bits separated by an even number of bit periods; wherein the modulator is a Mach-Zehnder modulator having a polarization rotation device in at least one arm; and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same.

In related art, Miyamoto discloses, an optical transmitting system. The system is configured to perform, differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal (figure 17 shows phase modulator 3 generating DPSK optical signal using the encoded signal, from precoding unit 2, with 2 bit separation; column 11 lines 16-18, column 16 lines 39-50); the system includes a MZM phase modulator 3; wherein the phase modulator 3 is configured to encode incoming data using phase shift; figures 13 and 14, column 14 line 55 - column 15 line 45).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of

Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22 (the two couplers are polarization independent couplers, meaning they do not separate the optical signal according to their polarization), two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) (Since phase shifters and polarization converters are within the arms of the interferometer; simultaneous polarization alternation and phase shift modulation can be accomplished).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claim 5**, and as applied to **claim 10 above**, Ito modified by Miyamoto disclose the invention as described above; except for, wherein the modulator is a Mach-Zehnder modulator including a polarization rotation device in at least one arm.

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22, two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claim 6**, and **as applied to claim 5 above**, Ito modified by Miyamoto and Van Der Tol disclose the invention as described above, except for, wherein the polarization rotation device is a half-wave plate. The Examiner takes official notice that it is well known in the art that a half-wave plate is use for polarization rotation of 90 degrees. Since Van Der Tol discloses a polarization converter for converting TE to TM polarization and vice versa. Then it would have been obvious for a person of ordinary skill in the art to know that the polarization converter can be a half-wave plate. Since using a half-wave plate for polarization rotation is simple and requires little components; thus, reducing the cost of the system.

Consider **claims 7 and 8**, and **as applied to claim 5 above**, Ito modified by Miyamoto and Van Der Tol disclosed a phase modulator, but fails to disclose a phase modulator is driven by a sinusoidal RF voltage or square pulses.

The examiner take office notice that it is well known in the art at the time of the invention that either sinusoidal RF voltage or square pulse can be use to drive a typical phase modulator. Since, different applications have different requirements, thus, using sinusoidal RF voltage or square pulses to drive a phase modulator provides different fills the different requirements of a particular application. Also, Ito disclosed a polarization modulator that is driven a train of square pulses 102, that running at half the bit rate (figure 15).

Consider **claim 12**, Ito discloses, a method of APol-PSK transmission comprising: precoding an electronic data signal (read as, an intensity modulator 2, modulating optical signal with NZR data; figure 13); using an electronic data signal to drive a modulator to provide simultaneous polarization alternation and optical data encoding by phase shift keying to generate an APol-PSK signal (figure 13 shows, combination intensity modulator 2, phase modulator 3 and polarization modulator 4, modulate the optical signal; such that, adjacent bits are mutually orthogonal in term of polarization; column 10 lines 10-45). The Examiner takes Official Notice that it is well known in the art to use phase shift keying and differential phase shifting keying as modulation scheme for long distance transmission, since they offer efficient bandwidth usage; thus allowing more data to be transmitted. It would have been obvious for a person of ordinary skill in the art to understand that the phase modulator 3, figure 13, disclosed in Ito can be arranged to perform PSK or DPSK modulation.

Ito fails to disclose, wherein the modulator is a Mach-Zehnder modulator having a polarization rotation device in at least one arm; and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same.

In related art, Miyamoto discloses, an optical transmitting system. The system includes a MZM phase modulator 3; wherein the phase modulator 3 is configured to encode incoming data using phase shift; figures 13 and 14, column 14 line 55 - column 15 line 45).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22 (the two couplers are polarization independent couplers, meaning they do not separate the optical signal according to their polarization), two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) (Since phase shifters and polarization converters are within the arms of the interferometer; simultaneous polarization alternation and phase shift modulation can be accomplished).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claim 13**, and as applied to **claim 12 above**, claim 13 is rejected for the same reason as claim 6 above.

Consider **claim 14**, and as applied to **claim 12 above**, Ito modified by Miyamoto and Van Der Tol further disclose, demodulating the APol-DPSK signal using an even bit delay line interferometer(Miyamoto disclose, Figure 17 shows a 2 bit delay optical filter 5 is placed at the transmitter end, while Figure 21 shows placing an optical filter 60 at the receiver end; thus it would have been obvious that the 2 bit delay optical filter 5 shown in figure 17 can also be placed at the receiver end; column 16 lines 40-50, column 17 lines 40-55).

Consider **claim 25**, Ito discloses, an optical transmitter for APol-PSK transmission comprising: an optical source (light source 1; figure 13); and the combined intensity modulator 2, phase modulator 3 and polarization modulator 4 provide polarization alternation and optical data encoding of an optical signal using phase shift keying. The Examiner takes Official Notice that it is well known in the art, for a phase modulator to be arranged to perform phase shift keying or differential phase shifting keying, for the same reason as indicated in claim 10.

Ito fails to disclose, differential phase shift keying between two optical bits separated by an even number of bit periods; a Mach-Zehnder (MZ) modulator device optically coupled to the laser source having a polarization rotation device in one arm; and drive circuitry coupled to the MZ modulator device to drive a MZ modulator; and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same.

In related art, Miyamoto discloses, an optical transmitter for APol-PSK transmission comprising: a Mach-Zehnder (MZ) modulator device optically coupled to the laser source (optical phase modulator 3, MZM type, is connected to light source 4'; figures 13 and 14, column 14 line 55 - column 15 line 45) and drive circuitry coupled to the MZ modulator device to drive a MZ modulator to provides optical data encoding of an optical signal using phase shift keying (phase modulator 3 is configure to encode incoming data using phase shift and generating DPSK signal; figures 13 and 14, column 14 line 55 - column 15 line 45). Further, the transmitter is configure to perform, differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal (figure 17 shows phase modulator 3 generating DPSK optical signal using the encoded signal, from precoding unit 2, with 2 bit separation; column 11 lines 16-18, column 16 lines 39-50).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22 (the two couplers are polarization independent couplers, meaning they do not separate the optical signal according to their polarization), two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) (Since phase shifters and polarization converters are within the arms of the interferometer; simultaneous polarization alternation and phase shift modulation can be accomplished).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claims 19 and 20, and as applied to claim 25 above**, Ito modified by Miyamoto and Van Der Tol disclosed a phase modulator, but fails to disclose a phase modulator is driven by a sinusoidal RF voltage or square pulses.

The examiner take office notice that it is well known in the art at the time of the invention that either sinusoidal RF voltage or square pulse can be use to drive a typical phase modulator.

Since, different applications have different requirements, thus, using sinusoidal RF voltage or square pulses to drive a phase modulator provides different fills the different requirements of a particular application. Also, Ito disclosed a polarization modulator that is driven a train of square pulses 102, that running at half the bit rate (figure 15).

Consider **claim 26**, Ito discloses, an optical transmitter for APol-DPSK transmission comprising: an optical source (light source 1; figure 13); a precoder (intensity modulator 2; figure 13); and the combined intensity modulator 2, phase modulator 3 and polarization modulator 4 provide polarization alternation and optical data encoding of an optical signal using phase shift keying. The Examiner takes Official Notice that it is well known in the art, for a phase modulator to be arranged to perform phase shift keying or differential phase shifting keying, for the same reason as indicated in claim 10.

Ito fails to disclose, differential phase shift keying between two optical bits separated by an even number of bit periods; a Mach-Zehnder (MZ) modulator device optically coupled to the laser source having a polarization rotation device in one arm; a Mach-Zehnder (MZ) modulator device optically coupled to the laser source having a half wave plate in one arm; and drive circuitry coupled to the MZ modulator device to drive a MZ modulator; and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same.

In related art, Miyamoto discloses, an optical transmitter for APol-PSK transmission comprising: a Mach-Zehnder (MZ) modulator device optically coupled to the laser source (optical phase modulator 3, MZM type, is connected to light source 4'; figures 13 and 14, column 14 line 55 - column 15 line 45) and drive circuitry coupled to the MZ modulator device to drive a MZ modulator to provides optical data encoding of an optical signal using phase shift

keying (phase modulator 3 is configure to encode incoming data using phase shift and generating DPSK signal; figures 13 and 14, column 14 line 55 - column 15 line 45). Further, the transmitter is configure to perform, differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal (figure 17 shows phase modulator 3 generating DPSK optical signal using the encoded signal, from precoding unit 2, with 2 bit separation; column 11 lines 16-18, column 16 lines 39-50).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator having a half-wave plate in one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22 (the two couplers are polarization independent couplers, meaning they do not separate the optical signal according to their polarization), two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) (Since phase shifters and polarization converters are within the arms of the interferometer; simultaneous polarization alternation and phase shift modulation can be accomplished). The Examiner takes official notice that it is well known in the art that a half-wave plate is use for polarization rotation of 90 degrees. Since Van Der Tol discloses a polarization converter for converting TE to TM polarization and vice versa. Then it would have been obvious for a person of ordinary skill in the art to know that the polarization converter can be a half-wave plate. Since using a half-wave

plate for polarization rotation is simple and requires little components; thus, reducing the cost of the system.

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Miyamoto as modified by Ito. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claim 28**, Ito discloses, an optical transmitter for APol-DPSK transmission comprising: an optical source (light source 1; figure 13); and the combined intensity modulator 2, phase modulator 3 and polarization modulator 4 provide polarization alternation and optical data encoding of an optical signal using phase shift keying. The Examiner takes Official Notice that it is well known in the art, for a phase modulator to be arranged to perform phase shift keying or differential phase shifting keying, for the same reason as indicated in claim 10.

Ito fails to disclose, differential phase shift keying between two optical bits separated by an even number of bit periods; a Mach-Zehnder (MZ) modulator device optically coupled to the laser source having a polarization rotation device in one arm; a modulator means having a polarization rotation device.

In related art, Miyamoto discloses, an optical transmitter for APol-PSK transmission comprising: a Mach-Zehnder (MZ) modulator device optically coupled to the laser source (optical phase modulator 3, MZM type, is connected to light source 4'; figures 13 and 14, column 14 line 55 - column 15 line 45). Further, the transmitter is configured to perform, differential phase shift keying between two optical bits separated by an even number of bit

periods to generate an encoded optical signal (figure 17 shows phase modulator 3 generating DPSK optical signal using the encoded signal, from precoding unit 2, with 2 bit separation; column 11 lines 16-18, column 16 lines 39-50)

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22, two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) .

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

9. **Claims 21, 22, 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ito (US Patent # 6,650,846)** in view of **Miyamoto et al. (US Patent # 7,116,917)** and further in view of **Van Der Tol (US Patent # 5,708,734)** and further in view of **Yao (US Patent# 5,654,818)**.

Consider **claim 21**, and as **applied to claim 25 above**, Ito modified by Miyamoto and Van Der Tol disclosed wherein the Mach-Zehnder modulator comprises two complementary

output ports (Van Der Tol shows in figure 3, each arm of the interferometer provides a different output; column 5 lines 1-55), but fails to disclose wherein the apparatus transmitter further comprises a polarization beam combiner for combining outputs from the two output ports of the Mach-Zehnder modulator.

In related art, Yao discloses an interferometer which includes a polarization beam combiner 12' for combining the outputs from each arm of the interferometer (figure 3; column 6 lines 1-18).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Yao with Ito modified by Miyamoto and Van Der Tol. Since a polarization beam combiner's function is equivalent to a polarization independent beam combiner; thus they can be use interchangeably.

Consider **claims 22 and 23, and as applied to claim 21 above**, Ito modified by Miyamoto, Van Der Tol and Yao disclosed a phase modulator, but fails to disclose a phase modulator is driven by a sinusoidal RF voltage or square pulses.

The examiner take office notice that it is well known in the art at the time of the invention that either sinusoidal RF voltage or square pulse can be use to drive a typical phase modulator. Since, different applications have different requirements, thus, using sinusoidal RF voltage or square pulses to drive a phase modulator provides different fills the different requirements of a particular application. Also, Ito disclosed a polarization modulator that is driven a train of square pulses 102, that running at half the bit rate (figure 15).

10. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ito (US Patent # 6,650,846)** in view of **Miyamoto et al. (US Patent # 7,116,917)** and further in view of **Fujiwara et al. (US PGPub 2003/0161638)**.

Consider **claim 4**, and as applied to **claim 10** above, Ito modified by Miyamoto disclosed the invention as described above, except for, wherein the optical signal is launched into the modulator having a polarization oriented at a predetermined angle such that the polarization of successive optical bits of the output signal are substantially orthogonal.

In related art, Fujiwara discloses, wherein the optical signal is launched into the modulator (polarization scrambler; figure 22A) having a polarization oriented at a predetermined angle (the polarization entering the polarization scrambler is oriented at 45 degrees) such that the polarization of successive optical bits of the output signal are substantially orthogonal (figure 22A; paragraphs 0194, 0198).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Fujiwara with Ito modified by Miyamoto. Since, Fujiwara et al. disclose a device with can perform polarization alternation of optical signal with less components; thus, reducing the overall cost of the transmission system.

Response to Arguments

11. Applicant's arguments filed 05/05/2008 have been fully considered but they are not persuasive.

On pages 9 the applicant argues, neither of the references teaches APOL differential phase shift keyed modulation format. Also, Ito's "intensity modulator 2, modulating optical signal with NRZ data" is not directed to precoding a signal; and phase modulator 3 is not a data

modulator. The examiner respectfully disagrees, as indicated in the rejection above, Ito disclosed an apparatus that can perform phase modulation and polarization alternation upon an optical signal (figures 13 and 14). The rejection above further explained that the phase modulator can be easily modified to perform PSK or DPSK modulation. Ito's "intensity modulator 2, modulating optical signal with NRZ data" is directed toward modulating an NRZ data, which is a precoded data. Ito's phase modulator 3 is a data modulator, as shown in figure 14, where it modulates the NRZ data.

On page 10 the applicant argues, Miyamoto also failed to disclose "differential phase shift keying between two optical bits separated by an even number of bit periods." Also, the two bit delay precoding and two bit delay optical filter only work using "dual mode beat pulse light source" and doesn't work with CW source. Further there is no motivation to combine Miyamoto. The examiner respectfully disagrees, Figure 17 shows an optical precoding circuit that using a delay of 2 bits; thus optical bits subject to DPSK are separated from each by 2 bit periods. Hence, it met the limitation "differential phase shift keying between two optical bits separated by an even number of bit periods". Further, on column 5 lines 10-15, Miyamoto clearly disclosed, "an optical phase modulating device that performs optical phase modulation on a signal from either a single longitudinal mode light source (CW light) or a dual mode beat pulse light source using the differential pre-coded NRZ signal generated by the pre-coding device". Thus, it can clearly be understood by a person of ordinary skill in the art that such optical phase modulation can be performed on the pre-coded signal using either CW light source or a dual mode beat pulse light source.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Miyamoto disclosed the process for generating DPSK optical signal using MZM, which was well known in the art at the time of the invention was made; and further to improve the transmission quality of the DPSK optical signal.

On page 11, the applicant argues, the definition of DPSK clearly shows that no delay is involved in the process. The examiner respectfully fully disagrees, Miyamoto clearly disclosed in figure 2 and column 10 lines 20-25, "the MZ modulator 32 generates the DPSK optical signal that is encoded using a DPSK format." Further column 5 lines 50-56 disclosed "The phase modulating device, for example, generates an encoded DPSK phase modulation signal using differential phase shift keying".

On page 12, the applicant argues, "the examiner's contention that the Van Der Tol reference teaches execution of DPSK modulation" is incorrect. The examiner, wants to clarify that the Van Der Tol reference was brought in not to teach DPSK modulation, but rather to show that Phase modulator and Polarization alternation means can be built into a signal MZM, as disclosed in figures 2 and 3 of the reference.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

13. Any response to this Office Action should be **faxed to (571) 273-8300 or mailed to:**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Hand-delivered responses should be brought to

Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

14. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Thi Le whose telephone number is (571) 270-1104. The Examiner can normally be reached on Monday-Friday from 7:30am to 5:00pm.

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If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kenneth Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or 703-305-3028.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist/customer service whose telephone number is (571) 272-2600.

Thi Le

*/Kenneth N Vanderpuye/
Supervisory Patent Examiner, Art Unit 2613*

Application Number**Application/Control No.**

10/815,033

**Applicant(s)/Patent under
Reexamination**

DORRER ET AL.

Examiner

THI Q. LE

Art Unit

2613